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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,140	08/27/2004	Ching-Hung Kao	NAUP0622USA	5139

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NORTH AMERICA INTELLECTUAL PROPERTY CORPORATION  
P.O. BOX 506  
MERRIFIELD, VA 22116

EXAMINER
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NGUYEN, TRAM HOANG

ART UNIT	PAPER NUMBER
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2818

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	04/02/2007	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/02/2007.

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**Office Action Summary**

Application No.

10/711,140

Applicant(s)

KAO, CHING-HUNG

Examiner

Tram H. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 January 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3 and 6-17 is/are pending in the application.
- 4a) Of the above claim(s) 15-17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                                  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____   |

## **DETAILED ACTION**

In response to the communications dated 1/10/2007, claims 4-5 have been cancelled and claims 15-17 have been withdrawn from the consideration. Therefore, claims 1-3,6-14 are pending in this application.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

***Claims 1-3, 6-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ker et al. (US 6,576,958; hereinafter Ker), and further in view of Vashchenko et al. (US 7,056,761).***

Regarding the currently amended claim 1, Ker discloses: a junction varactor (fig. 7) comprising: a gate finger (reference numeral 50) lying across an ion well (reference numeral 42) of a semiconductor substrate (reference numeral 40); a gate dielectric (reference numeral 13) situated between said gate finger (50) and said ion well (42); a first ion diffusion region (reference numeral 44a) with first conductivity type (refer as P+ type) located in said ion well (42) at one side of said gate finger (see fig. 7), a first lightly doped drain (LDD) having said first conductivity type (refer as P\_LDD) in said ion well (42), and wherein said first LDD (P\_LDD) merges with said first ion diffusion region serving as an anode of said junction varactor (refer to Anode in Fig. 7) and extends laterally to said gate finger (see fig. 7); and a second ion diffusion region (reference numeral 44b/46) with a second conductivity type (refer as N+ type) opposite to said first conductivity type in said ion well (N-Well) at the other side of said gate finger (see fig. 7), said second ion diffusion region serving as a cathode of said junction varactor (refer to Cathode in Fig. 7).

Ker fails to teach a second lightly doped drain (LDD) of said second conductivity type opposite to said first conductivity type in said well, wherein the second LDD merges with said second ion diffusion region and extends laterally to said gate finger. However, Vashchenko has a similar varactor structure wherein a second lightly doped drain (LDD) of said second conductivity type opposite to said first conductivity type in

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said well, wherein the second LDD merges with said second ion diffusion region and extends laterally to said gate finger (see fig. 3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include a second lightly doped drain (LDD) of said second conductivity type opposite to said first conductivity type in said well, wherein the second LDD merges with said second ion diffusion region and extends laterally to said gate finger as taught by Vashchenko in the varactor structure as disclosed by Ker in order to provide a wide range of breakdown voltages (see Vashchenko: col. 1, paragraph 6).

Regarding **claim 2**, Ker and Vashchenko disclose all the limitations of the claimed invention; plus, Fig. 7 of Ker shows the ion well has said second conductivity type (N-Well).

Regarding **claim 3**, Ker and Vashchenko disclose all the limitations of the claimed invention for the reason above; furthermore, Fig. 7 of Ker exhibits the said ion well (N-Well) is electrically isolated by shallow trench isolation (reference numeral 48).

Regarding **claim 6**, Ker and Vashchenko disclose all the limitations of the claimed invention for reason above; moreover, Fig. 7 of Ker clearly shows said junction varactor comprising a spacer located on sidewalls of said gates.

Regarding **claim 7**, Ker and Vashchenko disclose all the limitations of the claimed invention for reason above except for said junction varactor comprising a salicide formed on said gate and on said first and second ion diffusion regions. However, it would have been obvious to one having ordinary skills in the art at the time

the invention was made to include a salicide formed on said gate and said first and second ion diffusion regions in the semiconductor device structure taught by Ker in order to reduce resistance.

Regarding **claim 8**, Ker and Vashchenko disclose all the limitations of the claimed invention for the reason above. Besides, Fig. 13a shows in operation, said gate of said junction varactor (Gp) is biased to a gate voltage VG that is not equal to 0 volt (co1.6, lines 54-55).

Regarding **claim 9**, Ker and Vashchenko disclose all the limitations of the claimed invention for the reason above except for said gate finger is a metal gate. However, Ker discloses the gate finger is a poly gate. Since metal and polysilicon are the preferable materials for the gate electrode; thus, it would have been an obvious one having ordinary skills in the art at the time the invention was made to interchange the Used material as taught by Ker to the other like materials since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use. In re Leshin, 125 USPQ 416.

Regarding **claim 10**, Ker and Vaschchenko disclose all the limitations of the claimed invention for the reason above; and Ker furthermore teaches the said gate is a poly-silicon gate (fig. 7; item 50).

Regarding **claim 11**, Ker and Vashchenko disclose all the limitations of the claimed invention for the reason above; in addition, Fig. 7 also shows said conductivity type is N type and said second conductivity type is P type.

Regarding the current amended claim 12, Ker and Vashchenko disclose a junction varactor (fig. 7) comprising: An N well formed in a semiconductor substrate (reference numeral 100); a first gate finger (reference numeral 50 Left) lying across said N-Well (N-well); a first gate dielectric (reference numeral 13 Left) interposed between said first gate finger and said N-well (see Fig. 7); second gate finger (refer numeral 50 Right) lying across said N well at one said of said first gate finger (50 Left); second gate dielectric (reference numeral 13 Right) interposed between said second gate finger (50 Right) and said N-well (see Fig. 7); a  $P^+$  ion diffusion region (refer to  $P^+$ ) located in said N well between said first and second gate fingers (see Fig. 7); a P type lightly doped drain (refer to  $P\_LDD$ ) merging with said  $P^+$  ion diffusion region ( $P^+$ ) and extending to said first gate finger and said second gate finger (see Fig. 7); a first  $N^+$  ion diffusion region (refer to  $N^+$ ) located in said N well at one said of said first gate that is opposite to said  $P^+$  ion diffusion region(see Fig. 7); and a second  $N^+$  ion diffusion region (refer to  $N^+$ ) located in said N well at one said of said second gate that is opposite to said  $P^+$  ion diffusion region, wherein said first  $N^+$  ion diffusion region and said second  $N^+$  ion diffusion region are electrically couple together and serve as a cathode of said junction varactor (see Fig. 7).

Ker fails to teach a first N type lightly doped drain (NLDD) merging with said first  $N^+$  ion diffusion region and extends laterally to said first gate finger; and a second N type lightly doped drain (NLDD) merging with said second  $N^+$  ion diffusion region and extends laterally to said second gate finger. However, Vashchenko has a similar varactor structure wherein N type lightly doped drain (NLDD) merging with said first  $N^+$

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ion diffusion region and extends laterally to said first gate finger (see fig. 3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include a first N type lightly doped drain (NLDD) merging with said first N+ ion diffusion region and extends laterally to said first gate finger; and a second N type lightly doped drain (NLDD) merging with said second N+ ion diffusion region and extends laterally to said second gate finger in the varactor structure as disclosed by Ker in order to provide a wide range of breakdown voltages (see Vashchenko: col. 1, paragraph 6).

Regarding **claim 13**, Ker and Vashchenko disclose all the limitations of the claimed invention for the reason above. Besides, Fig. 13a shows in operation, said gate of said junction varactor ( $G_p$ ) is biased to a gate voltage  $V_G$  that is not equal to 0 volt (co1.6, lines 54-55).

Regarding **claim 14**, Ker and Vashchenko disclose all the limitations of the claimed invention for the reason above. Moreover, Fig. 13a shows the gate voltage  $V_G$  (refer to  $G_n$ ) is  $V_{ss}$  (co1.6, line 55).

### **Conclusion**

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).



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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tram Hoang Nguyen whose telephone number is (571)272-5526. The examiner can normally be reached on Monday-Friday, 8:30 AM – 5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mathew Smith can be reached on (571)272-1907. The fax numbers for all communication(s) is (703)872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571)272-1625.

THN  
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03/26/2007

*Andy Thuy*  
*Andy Thuy*  
*Primary Examiner*